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Themis ㉔.

Mean Solar Time of Observation.		Apparent R.A.	Apparent N.P.D.
	h m s	h m s	° ′ ″
1859, April 6	12 50 55·6	13 50 0·94	101 5 6·93
7	12 46 15·8	13 49 16·92	101 1 12·28

Bellona ㉘.

Mean Solar Time of Observation.		Apparent R.A.	Apparent N.P.D.
	h m s	h m s	° ′ ″
1859, April 6	13 54 21·5	14 53 37·24	92 46 14·98
21	12 44 53·1	14 43 5·72	91 13 46·98

Europa (52).

Mean Solar Time of Observation.		Apparent R.A.	Apparent N.P.D.
	h m s	h m s	° ′ ″
1859, April 21	14 3 41·3	16 2 6·87	100 27 35·69

Observations of the Occultation of Saturn by the Moon, made at the Royal Observatory, Greenwich, 1859, May 8.

(*Communicated by the Astronomer Royal.*)

Phenomenon.	Greenwich Mean Solar Time of Obs.						
	Hour and Min.	Seconds observed by					
		M.	G.	D.	E.	C.	L.
	h m	s	s	s	s	s	s
First Contact with Ring	8 18	55·3	59·0		55·6	58·9	
First Contact with Ball	8 18				59·6		
Total Disapp. of Ball	8 19	33·2		27·6	33·5	32·4	
Total Disapp. of Ring	8 19	42·4	41·5	42·6	42·9	42·2	
First Reapp. of Ring	9 17	14·0					
First Reapp. of Ball	9 17	32·9		30·3			
Last Contact with Ball	9 17			55·3		52·3	
Last Contact with Ring	9 18	21·8	21·0	22·2	20·9	20·8	24·8

Notes by Mr. Main [M.].—The instrument used was the Sheepshanks' equatoreal; for the disappearance the eye-piece used was No. 4 with a high power, probably about 300; for the reappearance No. 1 was used, power about 100. The only points of interest noticed were, first, that at the disappearance

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when the moon's edge (unenlightened) was passing over the shadows lying on the apparently upper portion of the ring behind the ball, a curious flickering kind of light was produced as if disappearing and reappearing. Secondly, that at the reappearance of the planet, the faintness of its light as compared with that of the moon was very striking, and this might perhaps produce a trifling error in the observation of the first reappearance, which was however considered to be tolerably accurate. Mr. Main also observed the disappearance of a star of the 8th magnitude, which took place accurately at $9^h\ 11^m\ 36^s{\cdot}9$ Greenwich Mean Solar Time; it was afterwards ascertained to be identical with one which is numbered 17237–8 in Lalande's Catalogue.

By Mr. Glaisher [G.].—With the 39-inch achromatic telescope and a solar chronometer. The power was very low (only about 30) and the planet very faint; little confidence was felt in the observation of the first disappearance, and it was considered likely that it was fully a second too late. It was impossible with so low a power to detect the first reappearance at the bright limb. The observations of final disappearance and reappearance were considered good. The interval of time after emersion before the planet was distingnished with the naked eye was remarkable, and amounted to at least ten minutes.

By Mr. Dunkin [D].—With the 46-inch achromatic telescope in the Octagon Room, and a sidereal chronometer. At the disappearance the moon and *Saturn* were exceedingly tremulous, and it was found impossible to use more than a very low power (about 40); the observations were considered doubtful, particularly that of the disappearance of the ball, in consequence of the indistinctness of the planet. At the reappearance, *Saturn* was very faint, and the images were still unsteady; they were, however, much better than at the disappearance, so that it was found practicable to use a considerably higher power (about 150), the observations being all considered satisfactory.

By Mr. Ellis [E].—With the altazimuth, and a power of about 100. The observations were all considered satisfactory.

By Mr. Criswick [C].—With the telescope formerly attached to the west equatoreal, placed in the Octagon Room, and a solar chronometer. The observations of the disappearance were considered satisfactory, but those of the reappearance rough, in consequence of the extreme faintness of the planet. The power used was about 70.

By Mr. Lynn [L].—With the north equatoreal, and a power of about 60. It unfortunately appeared that at the disappearance the moon was hidden behind one of the turrets of the observatory, and no observation therefore could be made. The planet at the reappearance was very faint, and the first reappearance was therefore not caught, nor could satisfactory

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observations of the reappearance of the ball be obtained; that of the final reappearance was, however, considered accurate.

Further Observations of the Occultation of Saturn by the Moon on the 8th of May.

Observed by T. W. Burr, Esq., at Highbury.

The observations as to time on which I can place reliance were the last contacts of the ring both at immersion and emersion.

	Local Sidereal Time.	
	h m s	
Immersion, last contact of ring	11 23 37·1	Dark limb.
Emersion, ,, ,,	12 22 26	Bright limb.

No projection, illumination of the moon's limb or other abnormal phenomena were observed, but the contrast between the brilliancy of the moon and the dull leaden blue colour of the planet at the emersion was very striking. Telescope 4 ft. 4 in. achromatic, aperture 3⅜ in., power 173, longitude 23^{s} S.W.

Observed by William Simms, Jun., Esq.

The telescope employed was of 4 inches' aperture and 57 inches focal length; power 200.

The dark limb of the moon, which was clearly seen previously with a low power, passed steadily over the planet, without the slightest distortion appearing to either body, the unobscured portion of the planet retaining its usual light up to the disappearance of the edge of the ring.

The reappearance, which was carefully looked for, took place at a very rugged part of the moon's bright limb, and escaped observation until a considerable part of one of the ansæ of the rings was projected; so feeble was the light that I could not, for three or four seconds, believe it to be the planet. When the body was advanced about two-thirds of its diameter, I saw the band of dark shade over the planet, accompanying the edge of the moon, similar to the appearance noticed by myself and several observers at the last occultation of *Jupiter;* and which I now believe to be caused by the violet fringe of the secondary spectrum, seen round all very bright objects in refracting telescopes.

May not the projection of stars upon the moon's limb, frequently seen at occultations, be caused by the ray from the star having to pass through this violet fringe in its passage to the eye at the time of contact? Telescopes differing greatly in the amount of this colour might account for the irregularity of the observation of this phenomenon; and which, as far as I am aware, has not been seen in reflecting telescopes.

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Observed by J. W. Jeans, Esq., at Grantham.

The time of first contact is uncertain to one or two seconds, also that of first reappearance; but it is, I think, more accurate than the former; the times of total immersion and emersion are correct within very narrow limits. The only particular appearances which I noted were, that, upon immersion, the last portion of the ring seemed to linger for the fraction of a second, and then disappeared suddenly, and that, upon emersion, the colour of the planet was very ashy, but, I believe, entirely from contrast. I observed nothing noticeable which could be attributed to a lunar atmosphere, but certainly the conditions were highly unfavourable.

The instrument was a refractor, by Cary, of 4 inches aperture, equatoreally mounted; and, after several trials, I fixed upon a power of 120, as giving, *cæteris paribus*, the best view. The time was corrected by transits of *Regulus*, *β Leonis*, *ε Corvi*, and *α Virginis*; and the times of contact, &c., are given in corrected local sidereal time.

Barom. at 9$^{\text{h}}$ P.M., 30$^{\text{in}}$,100, rising. Therm. 48°.

Corrected Local Sidereal Time.

	h m s		h m s
First contact ...	11 17 37 ?	Total immersion	11 18 20·55
First reappearance	12 16 43 ?	Last contact ...	12 17 42·08

Lat. N. 52° 54′ 42″. Long. W. 0° 39″.

Observed by the Rev. W. R. Dawes, at Haddenham, Thame.

The lunar occultation of *Saturn* was well seen here on the evening of the 8th. I observed it with a power of 235 on the excellent 7¼-inch object-glass I have now in use.

At the disappearance, the dark edge of the moon was sharply defined on the rings and ball of the planet, without the slightest distortion of their figure. There was no extension of light along the moon's limb. Even the satellites disappeared without the slightest warning, and precisely at the edge, which was faintly visible.

At the reappearance, I could not perceive any dark shading contiguous to the moon's bright edge, such as was seen by myself and several other observers on *Jupiter*, on 2d January, 1858. The dark belt, south of the planet's equator, was clearly defined up to the very edge; and there was no distortion of any kind, either of the rings or ball.

The very pale greenish hue of *Saturn* contrasted strikingly with the brilliant yellowish light of the moon.

No attempt was made to note the time.

Observed by S. Whitbread, Esq., at Cardington.

	h m s		h m s
First contact	11 20 20	Reappearance	12 19 13
Disappearance	11 21 4	Last Contact	12 20 58

Local Sidereal Time, May 8, 0 . 0 . 0 = $3^h\ 3^m\ 8^s$. $1^m\ 39^s$ W. G.

Observed by Sir W. K. Murray, Bart., at Ochtertyre.

I observed the occultation of *Saturn* under favourable atmospheric circumstances on the 8th; but, unfortunately, just before the moon's limb approached the ball of the planet, the clockwork suddenly stopped, which caused a most untoward interruption, though only for an instant. I could not detect the slightest distortion or change in the image of the planet, either at disappearance or reappearance.

The instrument used was a 13-feet equatoreal, of 9 inches clear aperture, by Mr. Cooke, of York; power 120.

Mr. Airy's paper on Occultations of Stars by the Moon reminds me that, in observing the occultations of a double star last year, one of which was of a reddish tinge, it appeared to pass on to the disk of the moon, whereas the white star disappeared instantaneously.

Observed by Captain Noble, at Forest Lodge, Maresfield.

Previously to the occultation *Saturn* was examined in the twilight (from $7^h\ 45^m$ to 8^h M.T.). The detail of the planet was remarkably distinct. The banding on the body of *Saturn*, the nebulous ring (C), the sharp black shadow of the ball upon the rings, &c., being beautifully shown.

The first contact of the moon's limb with the preceding edge of the ring, took place about $11^h\ 24^m\ 44^s$ L.S.T. The disappearance of the preceding limb of *Saturn* at $11^h\ 24^m\ 50^s{\cdot}7$, and the final disappearance at $11^h\ 25^m\ 32^s{\cdot}2$.

	h m s
The preceding limb of the planet emerged at	12 23 10·8
The following limb of the planet emerged at	12 23 40·7
And the final total emersion took place at	12 24 1·3

The limb of the moon advanced over the planet with exceeding steadiness, every feature of the detail remaining perfectly distinct up to the instant of its disappearance. The most noticeable effect was exhibited on the emersion of *Saturn* from behind the bright limb of the moon. Owing to the effect of contrast he appeared of a faint greenish grey, or greyish green colour (such as might be produced by mixing yellow ochre and

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bistre with a great deal of water). Notwithstanding which the detail was extremely distinct, the planet presenting the appearance of a water-colour drawing which had been washed out, so as just to leave the outlines undisturbed. He apparently brightened rapidly on his recession from the moon. Neither the slightest distortion of figure, nor anything approaching to a shake or a wave, was seen, either during the immersion or emersion. I so entirely devoted my attention to the physical detail of the planet that the times given above must (with reference to the respective limbs of *Saturn*) be received with some caution. The observations of final disappearance and of total reappearance are, however, very good, and perfectly to be relied on. The telescope employed was my Ross equatoreal, of 61 inches focal length, and 4·2 inches aperture, with a power of 255 throughout.

Observed by W. R. Grove, Esq.

I observed the occultation with a 6-foot telescope, 4·3 inches aperture, power 165. I imagined that, upon the moment of first contact, the ring was a little drawn out into a point, succeeded by a knob or apparent excrescence; but on thinking it over since, it has occurred to me that, as I could not see the edge of the moon's dark limb, and had no clock or means to advise me of the moment of impact, the effects I noticed may well have been due to the cutting off, or, as it were, sharpening the point of the ring by the oblique incidence. I mention the apparent effect, however; as, if better observers have noticed it, there may be something in it as a corroboration.

From the impact until the total disappearance, I could not notice the slightest distortion.

On emergence, the extremely faint light of *Saturn*, contrasted with the moon, was very remarkable. *Saturn* was a mere ghost of himself, a faint grey-blue shadow. The line of the moon's edge was perfect, and no dark band was perceptible, as I and others noticed in the occultation of *Jupiter*. The part of the ring last emergent appeared flattened, or shorter than the opposite portion, doubtless from the greater contrast of light, or from irradiation. I think the former was the cause, as some disproportion continued after *Saturn* was clear of the moon, and distant from the edge about the diameter of its own orb. The atmosphere was better than the average for the early time of night, and I doubt not some good observations will have been made.

Observed by W. Lassell, Esq., at Bradstones, near Liverpool.

I observed the occultation of *Saturn* on the 8th instant with the 20-foot equatoreal, under as favourable circumstances as I usually obtain.

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The power used was 316 and the aperture 22 inches. At the immersion the moon's edge was remarkably sharp, black, and smooth, while the planet, though sharp, quivered greatly about the middle of the immersion, which occupied about 51 seconds. The immersion was very oblique to the transverse axis of the ring, while at the emersion the planet protruded the end of its ring almost in the direction of a radius of the moon. At the emersion the planet was very steady and the moon's limb disturbed — a remarkable contrast to the phenomena of the immersion.

The colour of *Saturn* on emerging was certainly pale and of a greenish hue, in comparison with the moon's lustre and colour; yet, calling to mind the late occultation of *Jupiter*, it was not so pale and dull as I expected.

The time occupied by emersion was somewhere about 80 seconds, but I did not think it important to notice very exactly the times of the phenomena, my attention being engaged in closely watching for any remarkable appearance which might present itself. Nothing, however, did present itself worthy of remark; the planet underwent no distortion nor apparent alteration whatever during either transit across the moon's limb.

Right Ascension and North Polar Distance of the Minor Planets, from Observations made at the Madras Observatory in the Years 1853–1857. By Captain W. S. Jacob, late Director of the Madras Observatory.

⑤ *Astræa.*

	Mean Solar Time of Observation.	R.A. from Observation.	N.P.D. from Observation.
1853.	h m s	h m s	° ′ ″
Dec. 12	8 20 0·9	1 44 54·20	86 57 43·38
19	7 51 39·4	1 44 3·81	86 44 21·97
1856.			
Aug. 7	10 45 39·8	19 51 19·21	
22	9 36 34·7	19 41 11·46	

⑥ *Hebe.*

1857.			
Feb. 14	12 8 44·4	9 47 40·26	74 0 30·52
Mar. 2	....	....	71 34 11·67
3	10 47 14·8	9 32 58·59 }	71 27 59·35
	10 47 53·0	9 33 36·82 }	
5	10 38 53·8	9 32 29·29	
6	10 33 18·0	9 30 49·12	71 3 45·58
16	9 48 15·9	9 25 5·44	
19	....	....	69 47 16·45